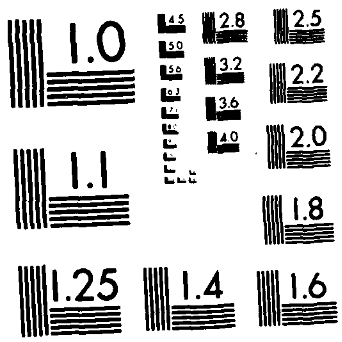
AD-A134 974 AN APPROACH TO THE DESIGN OF A MANAGEMENT INFORMATION SYSTEM: DEVELOPMENT..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. 1/1

UNCLASSIFIED E S WREKSOMINDOJO SEP 83 AFIT-LSSR-61-83 F/G 5/2 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

AN APPROACH TO THE DESIGN OF A MANAGEMENT INFORMATION SYSTEM: DEVELOPMENT PROCEDURE FOR THE INDONESIAN DEFENSE LOGISTICS STAFF

E. Sudaryanto Wreksomindojo
Major, Indonesia Army

LSSR 61-83

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

AN APPROACH TO THE DESIGN OF A MANAGEMENT INFORMATION SYSTEM: DEVELOPMENT PROCEDURE FOR THE INDONESIAN DEFENSE LOGISTICS STAFF

E. Sudaryanto Wreksomindojo
Major, Indonesia Army

LSSR 61-83

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER
LSSR 61-83

2. GOVT ACCESSION NO.
A134974

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)
AN APPROACH TO THE DESIGN OF A MANAGEMENT INFORMATION SYSTEM: DEVELOPMENT PROCEDURE FOR THE INDONESIAN DEFENSE LOGISTICS STAFF

5. TYPE OF REPORT & PERIOD COVERED
Master's Thesis

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
E. Sudaryanto Wreksomindojo
Major, Indonesia Army

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS
School of Systems and Logistics
Air Force Institute of Technology, WPAFB OH

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS
Department of Communication
AFIT/LSH, WPAFB OH 45433

12. REPORT DATE
September 1983

13. NUMBER OF PAGES
86

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)

15. SECURITY CLASS. (of this report)
UNCLASSIFIED

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)
Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES
Approved for public release: IAW AFR 190-17.
LYNN E. WOLAVER
Dean for Research and Professional Development
Air Force Institute of Technology (ATC)
Wright-Patterson AFB OH 45433

15 SEP 1983

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)
Management Information Systems
Indonesia
Information Systems
Logistics
Systems Design

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Thesis Chairman: Charles Beck, Major, USAF
Thesis Reader: Ronald H. Rasch, Major, USAF

DD FORM 1473, 1 JAN 73 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

The roles and participation of the managers in the Office of the Indonesian Defense Logistics Assistant has always been a major important factor in the establishment of the Indonesian Defense Logistics Management Information System (MIS). The objective of this research was to develop a procedure to describe the basic roles of these managers during the MIS development. A review of classical system development methodologies and factors affecting the success and failure of MIS was used as a foundation for developing the procedures. The seven steps of MIS design as outlined by Joel E. Ross was selected, enumerated, and applied to the Office of the Indonesian Defense Logistics Assistant environment. Further analysis on Determination of Information Needs was used as an example. Although additional research involving how to implement the managers' roles in the MIS development will be needed, this research will become a useful MIS development reference guide for the managers in the Office of the Indonesian Defense Logistics Assistant.

UNCLASSIFIED

LSSR 61-83

AN APPROACH TO THE DESIGN OF A MANAGEMENT INFORMATION SYSTEM: DEVELOPMENT PROCEDURE FOR THE INDONESIAN DEFENSE LOGISTICS STAFF

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirement for the

Degree of Master of Science in Logistics Management

By

E. Sudaryanto Wreksomindojo
Major, Indonesia Army

September 1983

This thesis, written by

Major E. Sudaryanto Wreksomindojo

has been accepted by the undersigned on behalf of the faculty of the School of Systems and Logistics in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN LOGISTICS MANAGEMENT

DATE: 28 September 1983

COMMITTEE CHAIRMAN

READER

ACKNOWLEDGEMENTS

A note of thanks and sincere appreciation is extended to Major Charles Beck, my thesis advisor, for his invaluable guidance, direction, and assistance throughout this research effort. Also, my deep gratitude goes to Major Ronald H. Rasch, my thesis reader, without whose advice and critical review this study could not have been accomplished. In addition, special appreciation is expressed to Major John R. Folkeson for his advice and assistance during the initiation of this study. A final note of gratitude must go to Mrs. Barbara Folkeson for her excellent support and dedicated efforts on my behalf in typing this thesis. Finally, my appreciation to my wife Sri, and my children Vivin, Sari, and Santi--in spite of their anxiousness to see the wonders of the United States, they have been patiently waiting for the completion of this thesis.

TABLE OF CONTENTS

CHAPTER | Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

> Dozens of studies on hundreds of companies have concluded that the most striking characteristics of the successful company is that MIS development has been viewed as a responsibility of management [15:25].

Background

Data Requirements

To meet the annual budget requirement, the Office of the Indonesian Defense Logistics Assistant needs to maintain current status regarding its equipment inventory. There are basically nine groups of major items to be concerned with: aircraft, ships, combat vehicles, general and special purpose vehicles, weapons and ammunitions, construction equipment, medical equipment and facilities, stationary equipment, and properties and installations.

In an attempt to acquire the necessary data, the Indonesian Department of Defense (DOD) launched a materiel census in early 1972. Data was collected and processed using the IBM computer available at the Administration Department of the Army and the Police Headquarters (18). Although the census was intended to achieve a standardized system to manage equipment, the results turned out to be far from what the managers expected. Due to the volume as well as the

variety of items, the system presented inaccurate information. The census attempt lacked a standarization of terms, an integrated code structure of the items, and a determination of what data were actually needed for the collection.

After about four years without progress, a task force was assigned to update the 1972 data. However, there was no significant improvement to note (18). Based on the complexities of the 1972 census, the Defense Logistics staff office concentrated on three groups of major items as pilot projects for the 1981 data collection (7:5-6): namely, weapons and ammunitions, general purpose and special purpose vehicles, and properties and installations. These items were selected because of their importance and urgency. Weapons and ammunitions are important items for combat operation; vehicles were selected in order to improve fuel control and mobility; properties and installations were selected since improvement of facilities was a major concern of the Indonesian Defense Logistics Office. The purpose of this recent data collection is still under evaluation.

To meet the need of an MIS, the Indonesian DOD established the MIS Board in 1973, followed by the Defense Data Processing Center in 1975. Four major areas of concern were the personnel MIS, the finance MIS, the logistics MIS, and the strategy and combat operation MIS (8:7-10). Joint task forces consisting of functional managers and data processing personnel were assigned to develop MIS in these areas.

However, in the logistics area, little activity occurred during 1976 through 1979; but action finally began in 1980 and followed by the 1981 data collection. The chronological events, from the 1972 materiel census, followed by the 1976 update and 1981 data collection, indicate an ongoing effort for the establishment of the logistics MIS.

Management Information Systems Defined

Since many Management Information System (MIS) definitions abound, it is appropriate to clearly define the term MIS as used in this study. As Dearden has suggested, it is difficult to describe MIS in a satisfactory way because this conceptual entity is embedded in a "mish-mash" of fuzzy thinking and incomprehensible jargon (3:90). Limited by the scope of this study and the general perceptions of MIS within the logistics community of the Indonesian DOD, an MIS is herein defined as an integrated, computer-based system for providing past, present, and projected information relating to internal operations and external intelligence. It supports the planning, control, and operational function of an organization by furnishing uniform information in the proper time-frame to assist the decision maker (2:122).

Literature Review

Various research has studied the success and failures of MIS. Robert W. Holmes (6:25) has suggested that management is better advised to investigate thoroughly and

to deploy constructively the factors contributing to the success of a MIS. They are listed in the order of their importance: (1) top management's involvement with the system; (2) management's ability to organize the MIS function; (3) the use of a master plan; (4) the attention given to human relations between functions involved; (5) management's ability to identify its information needs; (6) management's ability to apply judgement to information; (7) the condition of basic accounting, cost, and control systems; (8) the degree of confidence generated by accuracy at the input level; (9) the frequency of irrelevant or stale data provided; (10) the competence of systems technicians and their grasp of management problems; (11) the justification for projects undertaken; and (12) reliance on equipment vendors. Investigation of these factors will identify the causes of any unsatisfactory condition and, more importantly, will determine the proper responses leading to desired improvements.

Joel E. Ross (15:16,17) has identified ten problems that cause MIS failure: (1) overemphasis on the clerical system; (2) failure to close the communications gap between technician and manager-user; (3) overreliance on a consultant or computer manufacturer; (4) failure to design a master plan; (5) organization of the MIS function; (6) no management system to build upon; (7) no managerial participation in MIS design; (8) failure to identify information

needs; (9) poor system prior to changeover; (10) overloading human acceptance of the system. Ross (15:25) states further that of all the reasons for MIS failures, lack of managerial participation heads the list. For example,

> In a major aerospace firm, a very sophisticated and expensive MIS was recently installed to plan and control the cost, time and technical specifications of design projects. After significant dissatisfaction with the system, the users were asked their opinion of system malfunction. Their reply was that "the input to the system is no good." Further discussion revealed that the input was provided by the very users who complained. The conclusion emerged that user participation in the design phase would have avoided subsequent expensive and time-consuming rework [15:25].

Ross (15:26) gives three sound arguments for managerial participation. First, the time has come when the up-to-date manager must bring to the job at least a minimal familiarity with the topic of MIS. Second, from the point of view of the organization, the time is rapidly approaching when a company's information system will become a vital part of its operation just as marketing, operations, and finance are today. Third, it simply makes good sense for managers to become involved, because much better and more effective information systems will be the result of that involvement.

Statement of the Problem

The experiences of the Indonesian Defense Logistics Assistant, in light of the theory of MIS design, reveals significant problems. One of the major factors affecting the failure of the logistics MIS in the Office of the Indonesian

Defense Logistics Assistant is the lack of formal, written MIS development procedures for the managers to follow.

Research Objectives

The objective of this research is to develop a procedure to describe the basic roles of the managers in the Office of the Indonesian Defense Logistics Assistant during the MIS development.

Scope and Limitations

Due to limited resources, time constraints, and the researcher's past experiences, the scope of the research is limited to the major items inventory system of the Office of the Indonesian Defense Logistics Assistant; and for clarity and simplification the scope is narrowed down further to the vehicles inventory system.

Organization of the Study

The remainder of this thesis is composed of five chapters with content as follows: Chapter II is a literature review of the organization and mission of the Office of the Indonesian Defense Logistics Assistant and a brief description of existing logistics MIS support. Chapter III reviews the literature describing the classical MIS development methodology. Chapter IV contains the research methodology, discusses how to achieve the objective of the research, and contains the assumptions and limitations of the research.

Chapter V describes the application of the MIS development procedures in the Office of the Indonesian Defense Logistics Assistant. Chapter VI illustrates the detailed application of step 3 of the MIS design (Determine Information Needs). Chapter VII presents the conclusions and recommendations.

CHAPTER II

THE ORGANIZATION AND MISSION OF THE OFFICE OF THE INDONESIAN DEFENSE LOGISTICS ASSISTANT AND THE EXISTING LOGISTICS MIS SUPPORT

Organization and Mission

Within the Office of the Indonesian Minister of Defense, the logistics function is managed by the Office of Assistant of Logistics. The Assistant of Logistics is responsible to the Defense Administration Chief of Staff. The major functions of logistics are handled by eight sections responsible for planning and budgeting, procurement, supply control, maintenance and disposal, transportation, medical, industry, properties and installations. Each of the eight sections is supported by three or four bureaus (Figure 1).

Planning and Budgeting Section

This section formulates and prepares logistics plans, prepares the DOD logistics annual budget requirements, recommends improvement for the logistics support, and conducts staff evaluation on the implementation of logistics programs. This section is also responsible for developing the DOD materiel coding system for uniform identification of all inventory items.

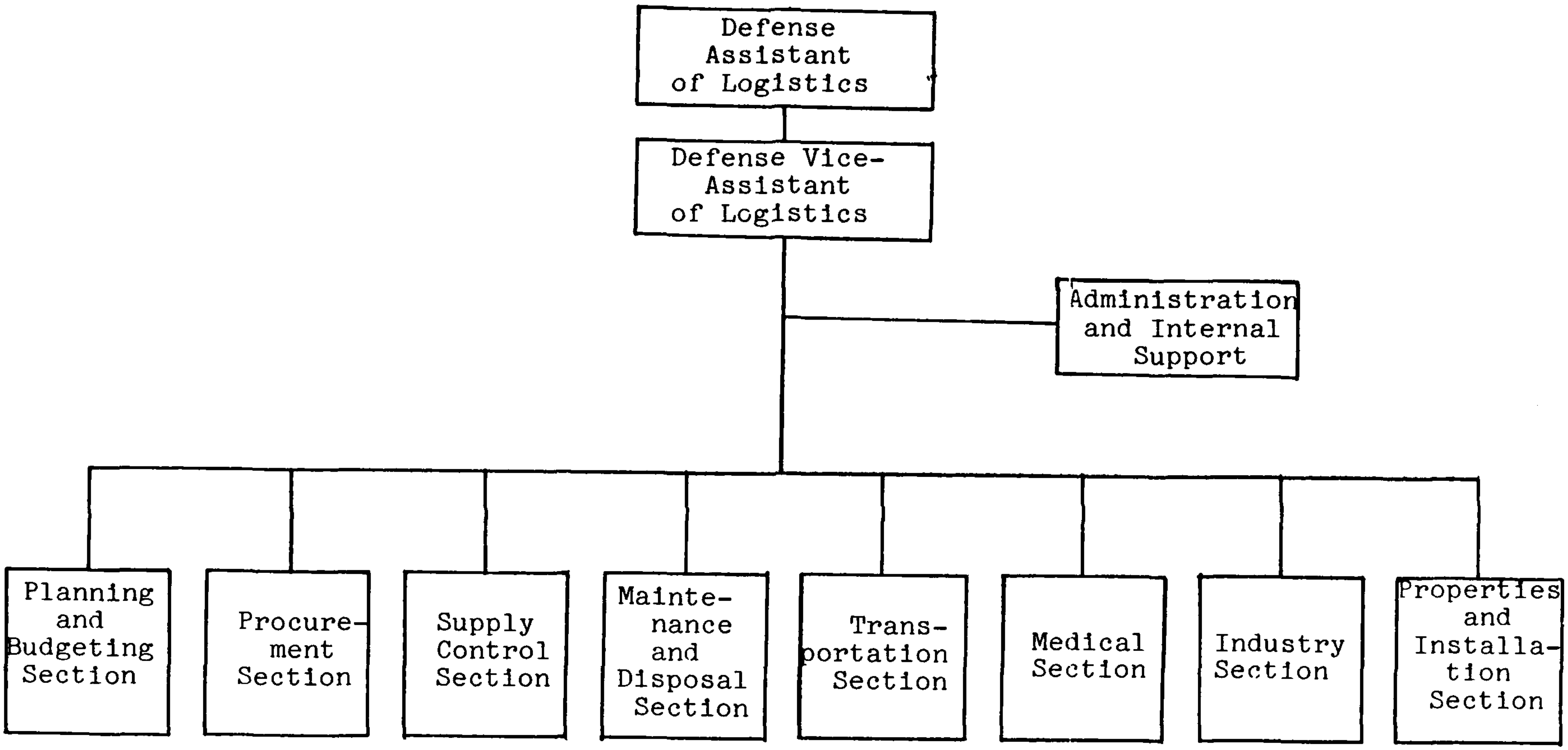


Fig. 1. Organization of the Office of the Defense Logistics Assistant

Procurement Section

This section formulates policy, procedures, and regulations for the procurement of materiel and supplies, for centralized and decentralized procurement, which includes types of contracts appropriate for different pricing situations, for identification of domestic and logistic resources, and for staff control on regional procurement.

Supply Control Section

This section formulates and develops policies and procedures for the supply control of common supply items, weapons and ammunitions, major equipment items, and electronics and communication equipment. This section also handles inventory and distribution management.

Maintenance and Disposal Section

This section formulates and develops maintenance and disposal procedures, evaluates inventory status, and establishes guidelines for efficient maintenance.

Transportation Section

This section's responsibilities include short and long range planning, control, and administration of the defense transportation, including land, sea, and air modes of transportation.

Medical Section

This section is responsible for the medical care

planning and the provision of medical facilities and supplies.

Industry Section

This section monitors and evaluates non-defense industrial development. The results of the evaluation become input for materiel order planning or for using non-defense industry to support national defense needs. This section also plans and develops management control and procedures of the defense industry.

Properties and Installation Section

This section formulates and develops policies and procedures for the management control of defense properties and installations, planning of construction, and maintenance.

The Existing Logistics MIS Support

Current MIS support is limited to the area of inventory status. Three of the eight sections of the Defense Logistics staff office described earlier (the supply control section, the maintenance and disposal section, and the properties and installations section) are now using this MIS support. Following is a brief description of the inventory status system (9:5; 18):

1. Output requirements and users:

   a. Annual Inventory Summary Report for the Office of the Minister of Finance. This report contains materiel inventory status

to include items such as number of vehicles, vehicles' condition, types of fuel used, vehicles' present value, and vehicles' location.

b. <u>Ad hoc Inventory Summary Reports for the Office of the Defense Administration Chief of Staff</u>. The content of the ad hoc reports varies depending upon current requirements. They may contain, for example, number of vehicles, vehicles' condition and location. Other reports may contain a list of vehicles by make, model and type, year, condition, and location.

c. <u>Other more detailed reports used by the Defense Logistics staff for internal management</u>. Such reports would assist procurement, supply, and maintenance and disposal functions. These reports list the individual vehicles including some, if not all, of the following data elements: license number, make, type, vehicle year, vehicle serial number, battery voltage and ampere hour, size of tire, type of fuel, vehicle condition, gross weight, load capacity, and reporting unit.

2. Sources of data:

Data for the various reports come from the logistics staff office at the Army headquarters, Navy headquarters, Air Force headquarters, and Police headquarters.

3. Automatic Data Processing (ADP) Support:

   a. The Defense Data Processing Center provides the ADP support with the use of Univac 1106 computers.

   b. In the area of inventory, data currently being processed at the Defense Processing Center includes weapons and ammunitions, general and special purpose vehicles (does not include combat vehicles), and properties and installations.

   c. The method of processing is in batch. Normal updating of the materiel inventory files takes place every three months, while information on procurement of new materiel or disposal of obsolete materiel takes place monthly.

CHAPTER III

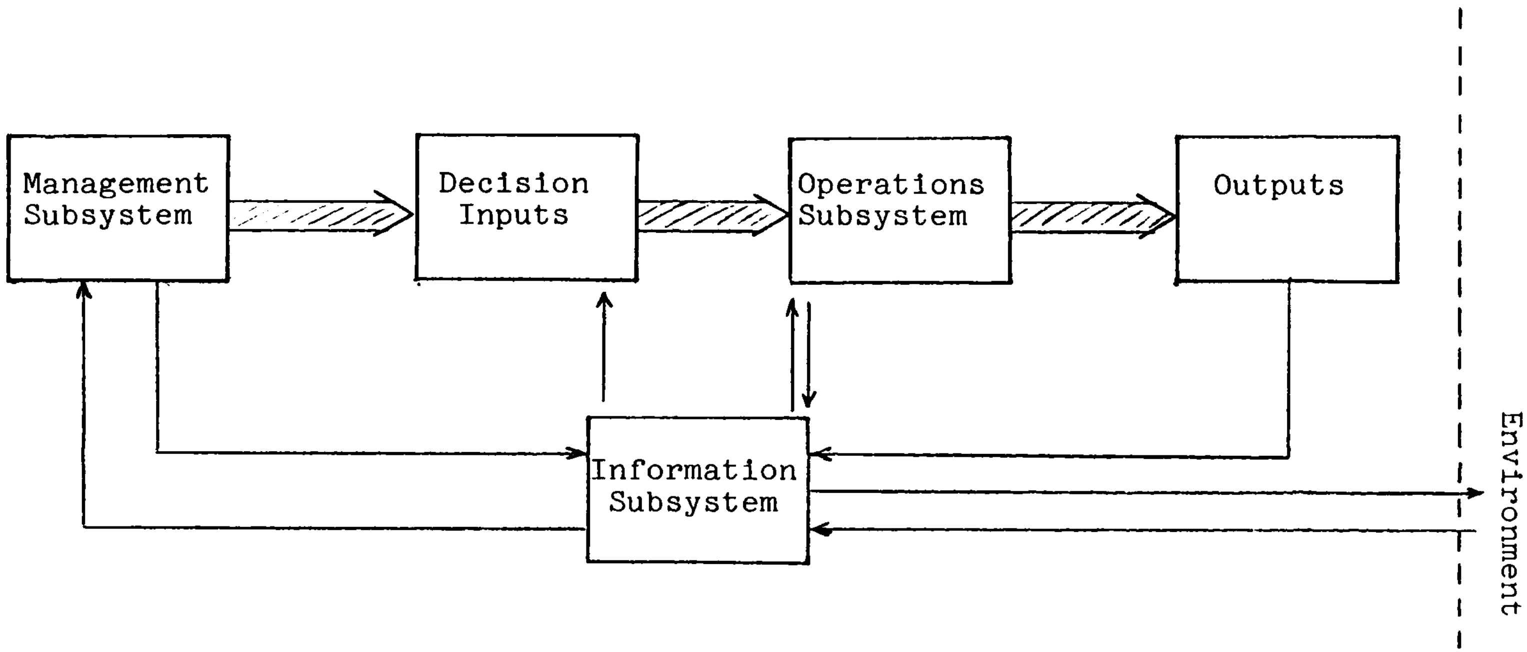
MIS DESIGN CONCEPT

MIS Concept

Burch, Strater, and Grudnitski (1:26) view any organization as a total system composed of three subsystems, namely the operations subsystem, the management subsystem, and the information subsystem (see Figure 2).

The management subsystem includes all the people and activities directly related to determining the planning, controlling, and decision-making aspects of the operations subsystem. The operations subsystem includes activities, material flow, and people directly related to performing the primary functions of the organization. The information subsystem is an assemblage or collection of people, practices, ideas, and activities that gather and process data in a manner that will meet the information requirements of an organization.

The information subsystem strives to serve all departments or operating groups equally at all levels of management. Variation in factors such as timing, level of detail, degree of precision, and scope of responsibility result in multiple informational requirements that differ from function to function and level to level (1:28).



Legend:

Flow of people, work, material, etc.

Flow of data and information

Fig. 2. Relationship Between the Management, Operations, and Information Subsystems of an Organization (1:27)

The objective of the MIS is to provide the right information to the right user at the right time at the least cost to aid in management decision making.

Data Versus Information

The main input to a MIS is raw data, but, as is true with so many other ingredients, much of the data's ultimate usefulness depends on how they are processed and merged with other elements. Data collection systems can often be classified as raw-data systems in that they deal with basic, low-level data. A given data element can be useful only to the extent that it "speaks for itself," since it rarely happens that data as data mean much (11:48). To be meaningful to the user, data must be processed and/or evaluated to become information. Information, as contrasted with raw data, is in a form suitable for informative or inference purposes, argument, or as a basis for forecasting or decision making. Figure 3 illustrates the process of transformation from data to information (16:144).

Information Attributes

In general, MIS is concerned with information pertinent to the achievement of organizational goals. Representations of an event require two basic types of information--quantitative and descriptive (14:10). According to Gerald E. Nichols, the majority of the information will be descriptive and will serve to identify what has been quantified. A

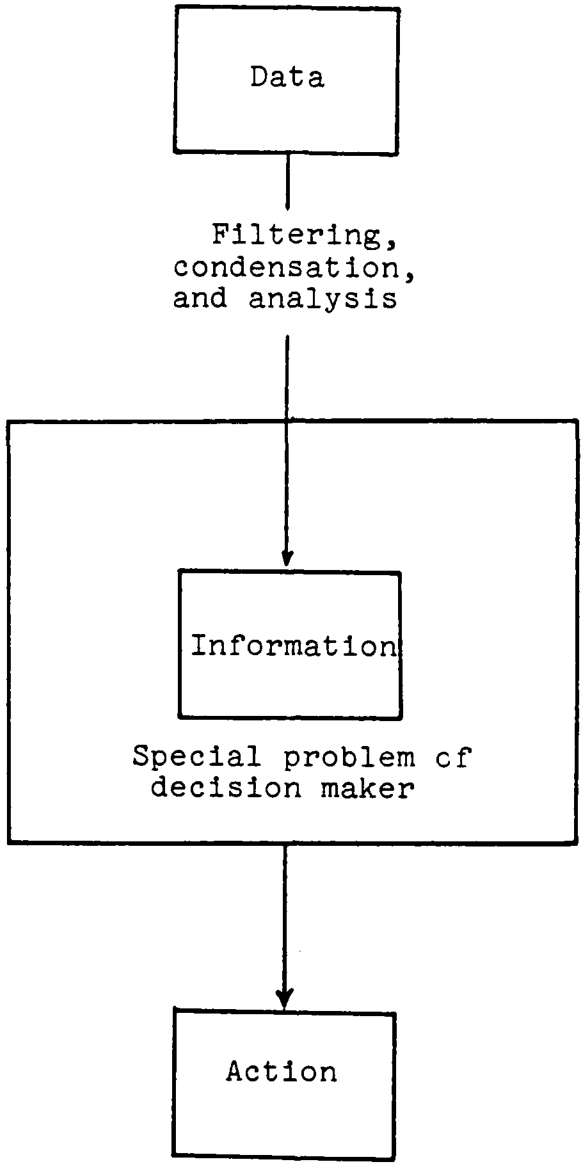


Fig. 3. Data Transformation (16:144)

partial list of desirable attributes for business information includes relevance, availability, timeliness, objectivity, sensitivity, comparability, and quality. Information must possess the first three attributes--relevance, availability, and timeliness--to have value, and thus to qualify as information. Objectivity, sensitivity, comparability, conciseness, and completeness are also desirable, but they are present and necessary only in varying degrees (14:11). The final attribute, quality, refers to the presence or absence of ambiguities.

Information Filtering Method

Persons at different levels of decision making require different degrees of detail for the performance of their duties. Figure 4 shows this relationship between levels of decision making and requirements for detail. As a rule, strategic decision makers have lower requirements for detail than either tactical or technical decision makers (1:123).

Along with Burch, Strater, and Grudnitski, Nichols (14:11) also stated that the lowest echelons of management are the most control-oriented, while top management is more planning-oriented. Figure 5 shows the relationship between management levels, planning, control, and information.

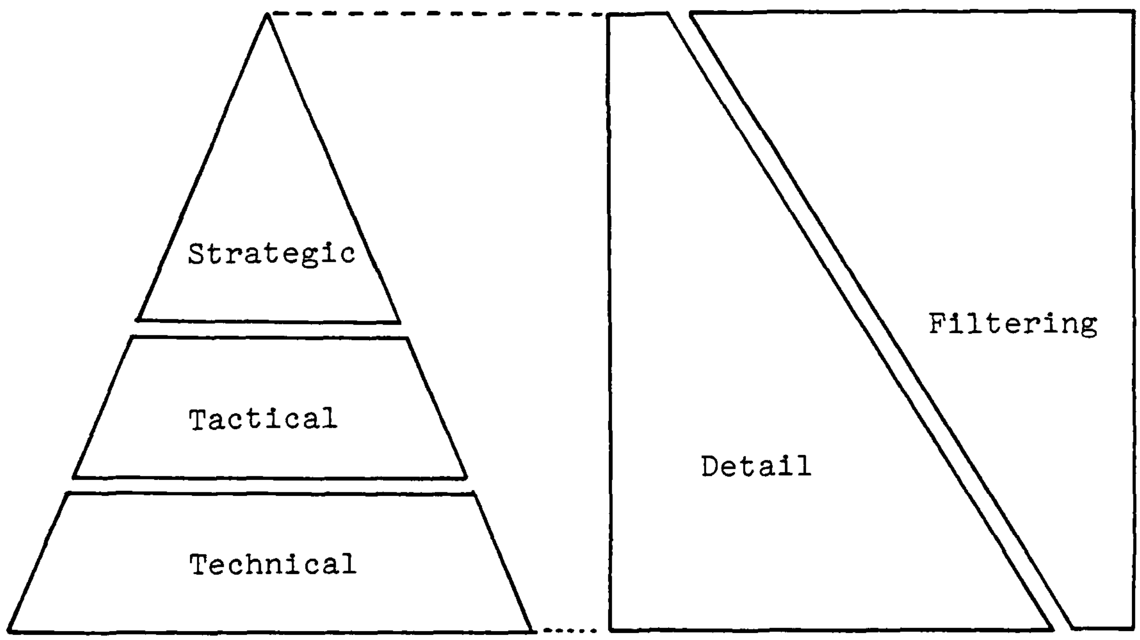


Fig. 4. Relationship Between Levels of Decision Making and Requirements for Detail Decision Making (1:123)

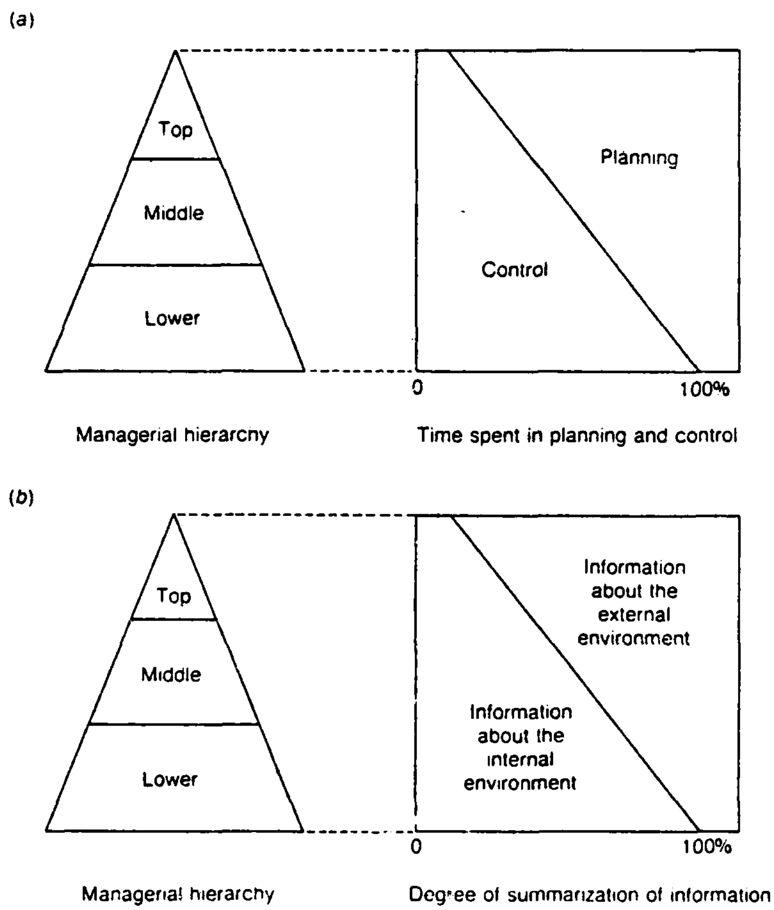


Fig. 5. Management Levels Relating to Planning, Control, and Information (14:11)

Basic Steps in MIS Design

The Need for a Management Base

Ross (15:23) states that, for some reason, many managers think they can patch up a company's shortcomings in basic management systems by applying a computerized management information system as a band-aid, but this approach won't work. If good planning and control do not exist within the framework of a good organizational structure, no degree of sophistication with a computer can cure the basic ill. MIS must be built on top of a management system that includes the organizational arrangements, the structure and procedures for adequate planning and control, the clear establishment of objectives, and all the other manifestations of good organization and management. Ross stresses further that only the manager-user can establish, repair, or modify the management system prior to overlaying the MIS on top of it.

Stages of MIS Development and the Manager's Role

Authors vary in identifying the stages or phases in the development of a MIS. Figure 6 compares the phases as viewed by four different authors.

Ligon (12:27-66) divides the development of a MIS into eight phases: feasibility study, requirement analysis, system specifications, system design, coding and programming, testing, documentation, and implementation. The discussion

Ligon (12:27)	Ross (15:231)	Burch, Strater, & Grudnitski (1:248)	Hartman, Matthes, & Proeme (4:1,2)
Feasibility Study	Set Systems Objectives	Systems Analysis	Analysis
Requirement Analysis	Establish Systems Constraints		
	Determine Information Needs	General Systems Design	Requirement Determination
Systems Specification	Determine Information Sources	Evaluation and Justification	
Systems Design	Detail Systems Concept	Detail Systems Design	Design and Development
Coding and Programming			
Testing	Test and Implement the System		
Documentation			
	Evaluate the System	Systems Implementation	Implementation and Evaluation
Implementation			

Fig. 6. Stages in the MIS Development: Four Researchers' Views

presented contains summaries of findings based on the Delphi technique. Through the Delphi technique, a composite of experts in the information systems field were questioned. The Delphi method was used to determine whether or not these experts agreed or disagreed as to the reasonableness of the criteria developed through the literature search. Although management/user involvement was considered as a major factor in the MIS development, Ligon does not discuss the actual roles of the managers themselves.

Burch, Strater, and Grudnitski (1:248) divide information systems development into five phases: systems analysis, general systems design, systems evaluation and justification, detail systems design, and systems implementation. Burch, Strater, and Grudnitski present a thorough discussion of systems development as a step-by-step approach used by systems analysts in performing their work. Management roles are discussed in a separate paragraph (1:46-51), but they are not directly related to each of the eight phases of the systems development. These roles include: managers as figurehead, liaison, leader, monitor, disseminator, spokesman, entrepreneur, disturbance handler, resource allocator, and negotiator.

Hartman, Matthes, and Proeme (4:1-2) classify systems development in four major areas: analysis, requirements determination, design and development, and implementation and evaluation. Each area is further defined with sub-steps and

discussions which fill six volumes. Management's role is emphasized in the requirements determination phase, as is the necessity for continuity of top management commitment and control throughout, from the decision to initiate the systems effort to implementation and evaluation.

Ross (15:231-267) has described the seven steps in MIS design from the point of view of the manager (user). The managers' roles are related to each step of the MIS design.

Since this research is intended for use by the functional managers (users), and since this research works with limited resources, it will use the MIS stages as suggested by Ross as shown in Figure 7.

The seven steps involved are not separate and distinct. Most of them are along a continuum, overlap, and are recycled (15:231). The process is iterative: designers constantly must reexamine and modify prior steps in light of what is learned in subsequent ones.

Setting the MIS objectives emphasizes that objectives must be framed in terms of what they contribute to the organization's objectives and how the processes of planning, organizing, and controlling are furthered. The second step refers to external and internal resources and environmental limitations that affect the optimum design of the system.

Once systems objectives and constraints are

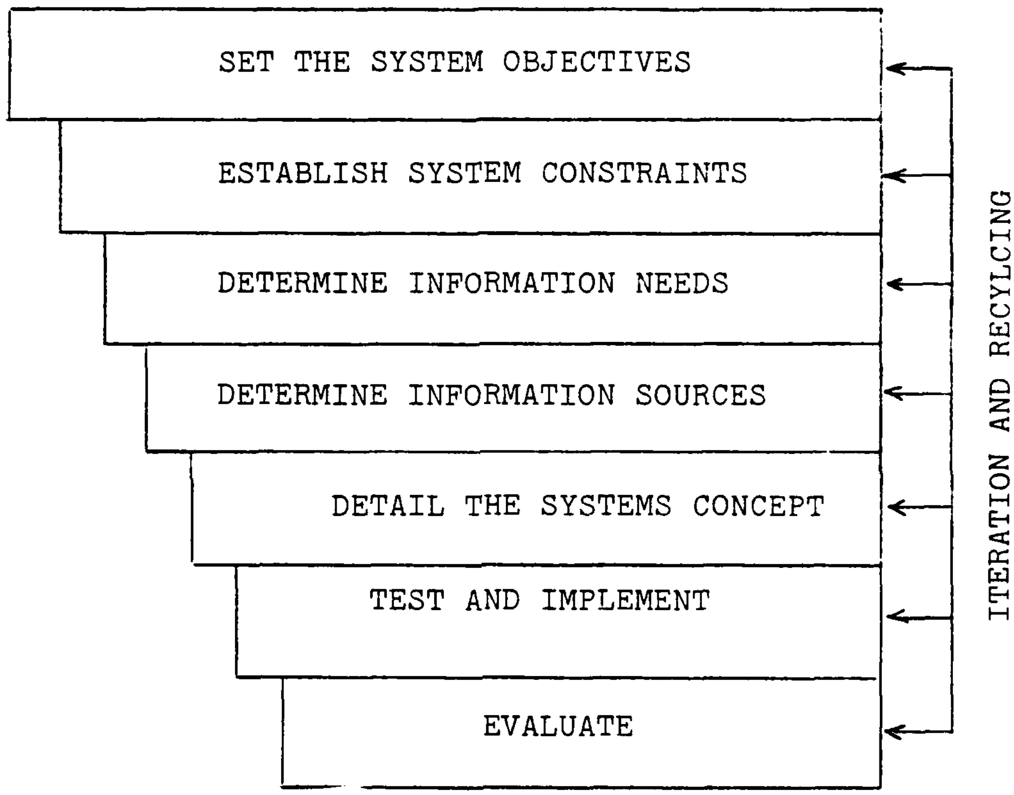


Fig. 7. Steps in the Design of an MIS (15:232)

established, the manager-designer can proceed to determine the information needs and sources. These should then be matched in order to evaluate whether information is available and whether information needs as defined will accomplish the predetermined objectives.

In step 5 which involves detailing the system concept, the actual inputs and outputs are specified and designed to meet information needs.

Step 6 tests and implements. Testing involves determining whether the system outputs meet the previously defined objectives and information needs. Implementation is the process of converting the systems specifications into an operating system.

Finally, the evaluation step measures systems performance against a criteria of effectiveness to determine whether objectives are being achieved.

CHAPTER IV

METHODOLOGY

To achieve the objective of the research, the methodology consists of applying a general principle to a particular situation, and analyzing the application through a simulated example. More specifically, the methodology will consist of the following steps:

1. Enumeration of the MIS design steps as outlined by Ross (15:230-265);

2. The application of Ross' principles to the Office of the Indonesian Defense Logistics Assistant;

3. The development of an example which applies step 3 of the MIS design for one section in the Office of the Indonesian Defense Logistics Assistant. This example is described in Chapter VI.

This chapter explains the three steps involved, concluding with a brief discussion of the assumptions and limitations of the research.

Enumeration of the MIS Design Steps as Outlined by Ross

As already mentioned earlier, the MIS procedure to be developed in this research is intended for the functional managers in the Office of the Indonesian Defense Logistics

Assistant; Chapter 3 has also discussed that for the purpose of this research, the Ross MIS design steps would be appropriate to use. Ross has described the MIS development from the viewpoint of the functional manager/user. Although the actual implementation of the procedures may require more detailed descriptions, this initial procedure developed based on Ross' principles will give a strong foundation for the managers to work on. Following the seven steps of MIS design comes a brief discussion of System Documentation. Past observations (18) in the Office of the Indonesian Defense Logistics Assistant reveal that system documentation also needs to be strongly reemphasized. The presently available documentation includes the 1972 materiel census procedures and the DOD directives on 1981 data collection. There is not yet any standard form of documentation.

The Application of Ross' Principles

Chapter V contains the main body of the MIS procedures to be developed in this research. Each of the MIS design steps is described and individually applied to the Office of the Indonesian Defense Logistics Assistant. The description of the MIS design steps closely follows Ross' procedures while using examples from the vehicles inventory system of the Office of the Indonesian Defense Logistics Assistant.

The Development of an Example (Determine Information Needs)

To give an illustration of how an MIS development procedure will apply to an actual situation in the Office of the Indonesian Defense Logistics Assistant, Chapter VI analyzes an example of step 3 of the MIS design (Determine Information Needs).

"Determine Information Needs" was selected as an example for the following reason: this step is a fundamental requirement in the MIS development; a clear statement of the Information Needs will minimize any deviation of the MIS development effort from its intended purpose or objective. However, the researcher has observed that this significant step was one area where managers in the Office of the Indonesian Defense Logistics Assistant have not given sufficient attention. Past observation indicates (18) that due to the vague statement of the information needs, some of the data collected were in fact irrelevant. Therefore, the example describes items that the logistics managers at the DOD level need to consider in determining the information needs. Based on the information needs, an example also explains the related data required as input for the MIS.

Assumptions and Limitations

Due to the limited resources and time constraints, the example described in Chapter VI applies only to the determination of Information Needs related to the Office of

the Indonesian Defense Logistics Assistant vehicles inventory system.

The researcher assumes that even though the explanations used in the procedures to be developed frequently relate to the Office of the Indonesian Defense Logistics Assistant vehicles inventory system, there will not be any difficulty in applying the procedure for other groups of major items being managed by the Office of the Indonesian Defense Logistics Assistant. The approach will be principally similar.

CHAPTER V

APPLICATIONS OF MIS PROCEDURES IN THE OFFICE OF THE INDONESIAN DEFENSE LOGISTICS ASSISTANT

This chapter describes the basic MIS development procedure as it relates to the roles of the managers during the MIS life cycle. The procedure is developed based on Ross' MIS design steps (15:230-265). As already mentioned in the preceding chapters, the application is limited to the area of vehicles inventory system of the Indonesian Defense Logistics Office.

Set the System Objectives

As Described by Ross

This first step in the MIS design is frequently the most difficult, and yet it must be clearly stated before we proceed to the next step. The manager must define system objectives in terms of satisfying legitimate demands for information, not of satisfying demands that are not related to an objective (15:233).

System objectives must be stated in terms of the objectives of the department, group, function, or manager to be served, or in terms of the functions the MIS is to perform. In other words, system objectives should express what managers can do after their information requirements have been

met. If possible, system objectives should be stated in quantitative rather than qualitative terms, so that system performance can be measured for effectiveness. However, there are cases when the managers should not oversimplify or ignore any crucial non-quantitative measures that may affect the overall objectives of the organization.

As It Is Applied to the Indonesian Defense Logistics Office

There are basically three levels of management in the Indonesian Defense Logistics Office--the Defense Administration Chief of Staff (KASMIN) and the Defense Logistics Assistant (ASLOG) as the top level, the section heads (Paban) as the middle level, and the heads of different bureaus (Karo) as the lower level. In developing an MIS, the objectives should encompass the differing needs of these three management levels. Therefore, the objectives of the Defense Vehicles Inventory MIS is to effectively provide:

- information on vehicles' readiness for the Defense Administration Chief of Staff and the Defense Logistics Assistant at the top level

- information on vehicles' procurement requirements and vehicles' disposal for the sections' heads at the middle level

- information on fuel and spare parts requirements for the heads of different bureaus at the lower level.

Determine Information Needs

As Described by Ross

To get a good system design, a clear statement of the information needs is fundamental and necessary. Before creating any sophisticated data bank, it is necessary to determine the real information needs that will increase the perception of managers in critical areas such as problems, alternatives, opportunities, and plans. Failure to define objectives and clearly state the information needs to reach the objective probably accounts for the failures of more design efforts than any other factor (15:236). As an aid for the manager to spell out the specific information requirements of his job, top management can require in writing from subordinate managers a statement containing: (a) a list of three to four major responsibilities for which the manager believes himself to be responsible, and (b) the three to four specific items of information that are required to perform the responsibilities.

Managers should be alert to how much detail of information is really needed. As outlined in Chapter III, there are three levels of management (i.e., strategic, tactical, and technical), each of which has varying needs of information. Each level needs different types of information, generally in different form. The strategic level needs the one-time report, the summary, and the single inquiry. The tactical level needs the exception report, the summary, and a

variety of regular reports for periodic evaluation. The technical level requires the formal report with fixed procedures and the day-to-day report of transactions. Managers at all levels have changing information needs, depending on the nature and importance of the particular decision.

As It Is Applied to the Indonesian Defense Logistics Office

In the Indonesian Defense Logistics Office environment, the Administrative Chief of Staff or the Logistics Assistant represents the strategic level, the Paban (section head) represents the tactical level, and the Karo (head of bureau) represents the technical level.

The Defense Logistics Assistant determines the information needs for the strategic level; for example, quantity of vehicles by vehicle classification (i.e., sedan, bus, light-medium-heavy truck, etc.), load capacity, condition, and location. This information may be useful for planning DOD nation-wide operations.

The Paban (section head) determines the information needs for the tactical level; for example, quantity of vehicles by vehicle classification, make, year, and condition. This information will be required for planning purposes, such as standardization of vehicles, procurement of vehicles and common supplies, and disposal planning.

The Karo (head of bureau) determines information needs for the technical level; for example, quantity of

vehicles by vehicle classification, type of fuel, and specifications of the tires and batteries required. This information will enable the Karo to allocate the monthly fuel allocation, the periodic tires and batteries requirements, etc.

Information needs largely depend on the system objectives. Figure 8 shows an example of a system objectives/information needs matrix.

Establish System Constraints

As Described by Ross

Establishing constraints will help ensure that the design is realistic (15:240). The system designers need to describe the conditions that will limit the attainment of the objectives. Constraints which are provided by the manager-user and/or the designer limit freedom of action in designing a system to achieve the objective. Constraints are classified as internal or external to the organization (15:240-243).

Internal Constraints.

1. Top management support. Top management support and approval is essential in order to get a good environment for the MIS development.

2. Organization and policy. Organizational and policy considerations frequently set limits on objectives and modify an intended approach to the design of a system.

System Objectives / Information Needs	Fuel Allocation Requirement	Spare-parts Requirement	Procurement and Disposal	Vehicles Readiness
Vehicle Classification	X	X	X	X
Type of Fuel	X			
Size of Tires		X		
Make & Type		X	X	
Specification of Battery		X		
Vehicle's Year			X	
Condition	X		X	X
Load Capacity				X
Location	X	X	X	X
Fuel Index	X			

Fig. 8. System Objectives/Information Needs Matrix

3. Manpower. The availability of knowledgeable personnel on both the design and use of MIS is a major limiting factor.

4. Cost. We should compare the cost to achieve the objective with the benefits to be derived. Consider the cost of resources required. Computer capacity and other facilities relating to the operation of a data-processing system should be used in an optimum way.

5. Acceptance by the people using the system. People problems are often mentioned where failure to achieve expected results is concerned. Here the difficulties are associated with the natural human reaction to change, the antagonism, and the lack of interest and support frequently met in system design and operation.

6. Functional imposed constraint. Data requirements, data volumes, and the frequency of processing are constraints imposed by the immediate users.

External Constraints. Among the considerations surrounding the external environment are those restrictions imposed by the government and suppliers. The government might impose certain restrictions on the processing of data, such as the need to maintain the security of certain classes of information. Suppliers are also required to be considered because the designed system sometimes refers with that group.

As It Is Applied to the Indonesian Defense Logistics Office

1. Top management support. It is necessary for the MIS development to obtain approval and continuous active involvement from the Defense Logistics Assistant and the Defense Administration Chief of Staff.

2. Organization and policy. The MIS design must take into account the already established regulations and policies of the Indonesian Defense Logistics Office. This includes: (a) the fuel allocation index for each of the vehicle classifications, for instance $2\frac{1}{2}$ gallons of gasoline for each sedan/light truck per day, 8 gallons of gasoline for each bus per day, etc.; (b) maintenance index of repair expenses; (c) the required annual inventory report to the Minister of Finance; and (d) regulation and policy on vehicles' procurement and disposal. Determination of information needs will be closely related to these regulations and policies.

3. Manpower. There are now a very limited number of officers/personnel in the Indonesian Defense Logistics Office who understand the design and use of MIS. An upgrading program for the personnel involved needs to be established, such as on how to use and complete the forms, and how to transmit data from the data sources to the data processing departments. The availability of computer systems analysts is also very limited; therefore, implementation

must be gradual, starting with pilot projects rather than designing the MIS for the whole spectrum of the major items currently being managed by the Defense Logistics Office.

4. Cost. With the present load at the Defense and Major Commands Data Processing Centers, computer processing time has not become a problem. However, the following costs need to be considered: (a) overhead cost for paperwork of the MIS development effort to include cost for conducting conferences, cost for training sessions, cost for any required outside consultants; (b) printing cost of forms for data collection and updating; (c) cost for transmitting data from the data sources; (d) cost for purchasing magnetic tapes/disks for the creation of files; (e) overtime cost for any hired civilian personnel; and (f) cost for the production of system documentation such as user design specification.

5. Acceptance by the people using the system. The system should be designed so that it will not eliminate the sense of responsibility and authority of the personnel involved. A training program needs to be set up for those personnel participating in the system, from the base level up to the headquarters level. The training program should establish the users' awareness of the importance and the ultimate results of the system. Form design should be simple to complete so that it will not discourage those who use it.

6. Functional imposed constraint. There are presently about 80,000 vehicles in the inventory. Section

heads who will use the system should determine the types of data to be collected, the collection sources, and the frequency of updating. The Defense Logistics Assistant should determine which section or which organization is authorized to retrieve the data.

Determine Information Sources As Described by Ross

Although some systems require some external information, most of the information sources are inside the organization itself: books, records, files, statistical and accounting documents, etc. In essence this step analyzes the present system. Present capabilities should be used or tailored as much as possible before imposing any new system requirements (15:243).

Any study of the information sources for a particular subsystem must examine how MIS integrates into the overall structure of the organization. Sources of information may be categorized as follows:

1. Internal and external records. Internal records could include examples of inputs or outputs, file records, memoranda, reports containing information about the existing system, and documentation of existing or planned systems. External records may be available, for example, from trade publications, government statistics, etc.

2. Interviewing the managers and operating

personnel. This form of data gathering can be the most fruitful method of securing information, provided it is conducted properly.

3. Sample and estimation of data. When the accumulation of data is so large that only a portion of it can be examined, sampling and estimating methods may become necessary for analysis purposes.

<u>As It Is Applied to the Indonesian Defense Logistics Office</u>

For any system improvement, the following existing files and forms used by the Indonesian DOD and Services provide references for information sources:

1. Vehicles Master Inventory Files that are kept and maintained at the Defense Data Processing Center, and the Armed Services' Data Processing Installations.

2. Forms LP-1, LP-2, LP-3, and A-16 or similar which are currently used by the Armed Services for quarterly reporting from base level to the headquarters level.

3. Vehicles annual inventory summary report for the Office of the Minister of Finance.

4. Vehicles' license files which are maintained at the Police headquarters.

Section heads or heads of bureaus in the Defense Logistics Office may be required to accept interviews conducted by the systems analysts for any additional information

required which may not have been well covered in the available written regulations/procedures/manuals.

Detail the System Concept

As Described by Ross

The major portion of detailing system concept lies with the system designer/analyst. However, this section examines managers' participations and the activities that the manager should be aware of (15:249).

The manager's involvement in the design process is analogous to the homeowner's participation in the architect's planning, where the basic design and many of the details are shaped by the wishes and needs of the person buying the house (13:289). So it is with a computer-based information system. The manager should be involved to the extent that the system provides information for his needs; the designer/analyst is concerned with the nature of the materials and equipment as well as with the technical processing considerations.

General System Flow Chart. The general system flow chart is a common method of indicating the general structure of a computer-based information system. Such a chart describes the data processing logic in general terms and reflects the design efforts prior to this step: setting objectives, establishing constraints, and determining information needs and sources.

A system flow chart is quite general in nature and indicates only the main components of the system. The chart does not indicate what processing occurs at particular steps in the flow or what specific data, equipment, or people are involved. However, the chart provides the foundation upon which a great many detailed specifications will follow.

System Inputs. From the manager's point of view, the inputs were structured when information sources were determined. The task of design of input format then follows. For the input to be processed, it must be in a machine-readable format. Where inputs are from other subsystems within the organization, integrating these subsystems through common data elements and other means becomes necessary.

More detailed input data may include the sources of data--i.e., where they come from, in what form, who is responsible for their production. Forms are so often used in data collection that form design becomes a primary concern for the system designers.

The managers should be aware that the following must be specified: the source of each input, its frequency, volume and timing, and its disposition after processing is completed. Editing procedures need to be established for checking the validity and volume of the input. Another important consideration is the specification that the inputs are to be converted into machine readable form.

System Outputs. Output data definition includes the specification of destination--i.e., where they go, in what form, and who is responsible to receive them. The output specification also includes the distribution of output (who gets what, number of copies, and by what means), the frequency with which output will be called for and its timing, and the media used (tape, hard copy, data terminal, etc.).

The design of the output form is a direct function of information needs and should be constructed to meet those needs in a timely fashion. Care should be taken not to ask for too much information too frequently. Management by exception and information by summary should be the guiding principles.

As It Is Applied to the Indonesian Defense Logistics Office

Since the purpose of the MIS development is to aid the managers in their job, Paban (section head) and Karo (head of bureau) should be involved or at least be aware of what is going on throughout the MIS life cycle. Paban and Karo should always ensure that the MIS to be developed will meet the system objectives and that the system will provide information for their needs.

General System Flow Chart. Figure 9 shows an example of a general system flow chart of the vehicle inventory MIS of the Indonesian Defense Logistics Office. Based on the

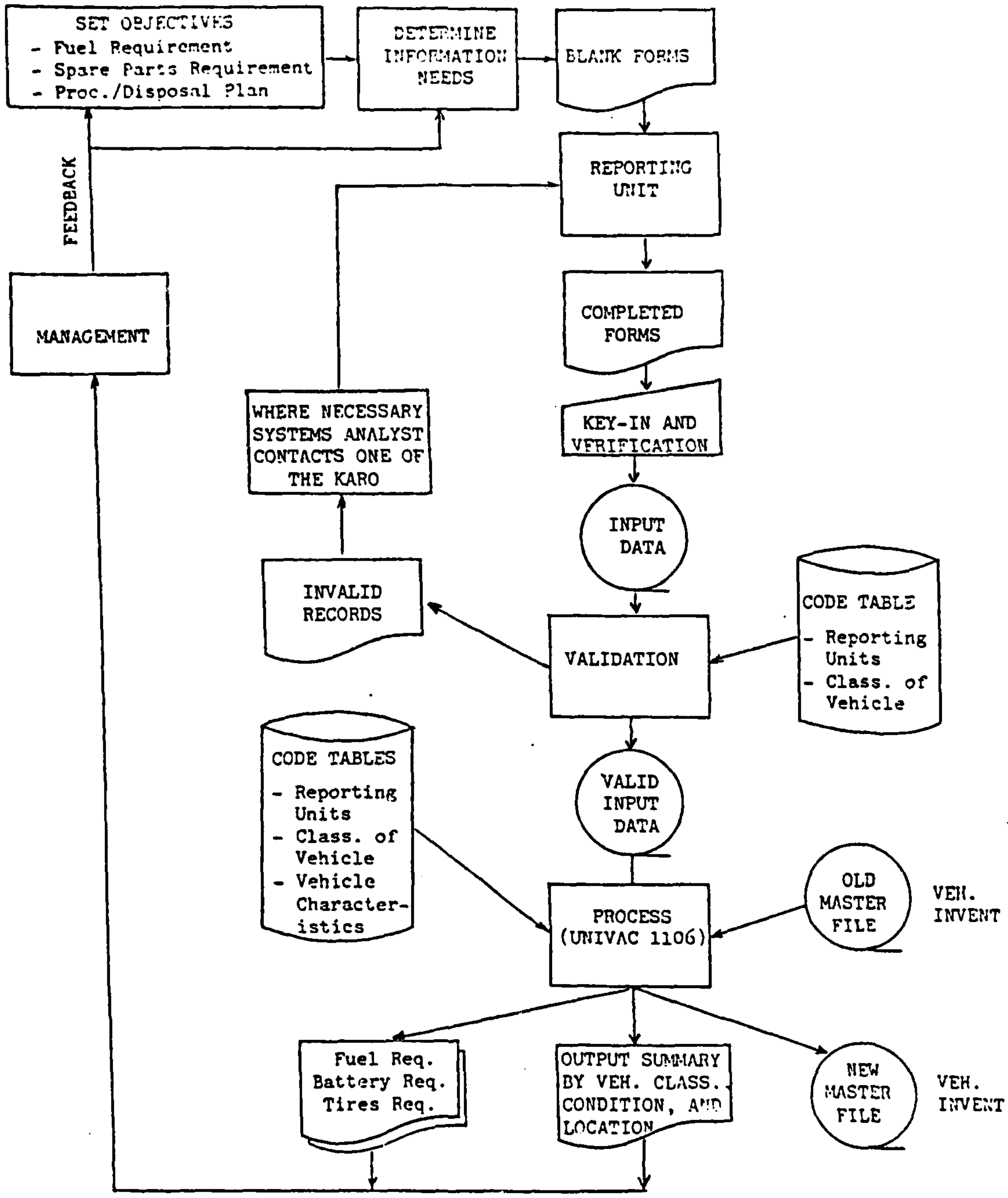


Fig. 9. General System Flow Chart of the Indonesian Defense Vehicles Inventory MIS.

objectives and information needs, forms are filled out and completed by the reporting units. Data from these forms are then entered and verified. At the Indonesian Defense Data Processing Center, for instance, verification of input data is accomplished by keying in the data twice by two different operators. If differences occur, the operator checks for error.

Vehicles may require checking based on the following:

1. Duplicate records. The same vehicle is reported twice.

2. Duplicate information. For example, two different vehicles with the same license number.

3. Range checking. The data for vehicle condition, for instance, must always consist of two digits, and they are either BB (good), RR (not operational but economical to be repaired), or RB (not operational and not economical to be repaired).

4. Unknown or miscoded reporting unit.

5. Other necessary validation checks.

Where necessary the systems analyst will contact one of the Karo (heads of bureaus) for the invalid records and make corrections accordingly.

Valid records are processed in batch using the existing computer at the Defense Data Processing Center--Univac 1106. Output from this process may consist of: (a) new (updated) vehicle inventory master file; (b) reports on

fuel requirement, batteries requirement, tires requirement; (c) some output summaries, such as summary by vehicle's classification (sedan, light truck, bus, etc.), by conditions, by location; (d) etc.

These output records will provide managers with information either for their routine or for their ad hoc requirements. Management could review these outputs from time to time and improve or modify the system objectives and information needs.

System Inputs. One of the major components of the system inputs is the input form. Paban (section head) or Karo (head of bureau) should verify that the form designed will be sufficient to accept data to be collected; yet the form must be simple, easy to read, and to complete. The form should have convenient spaces to accommodate coding by the reporting units. Coding is, for instance, applied to the description of reporting units and vehicle classification/nomenclature. An example of coding is as follows:

Vehicle Classification Description	Code
Motorcycle	01
Sedan	02
Light Truck	03
Bus	06

Vehicle Make Description	Code
Chevrolet	03
Datsun	04
Dodge	05
Fiat	06
Honda Civic	07

Generation of codes must be supervised and approved by the assigned Karo. Terms used throughout the system must be consistent and well understood by all the personnel involved.

Data may come from base or headquarters level, transmitted either in hard copy or on magnetic diskette, depending on the facilities available. The logistics officer at the originating base or headquarters is responsible for the accuracy and the transmission of the data to the Defense Logistics Office. The Vehicle Inventory Master File is maintained either at the Defense Data Processing Center or at the Services' Data Processing installations. The Defense Logistics Office must establish timing and frequency of update, whether monthly, quarterly, semi-annually, or annually.

System Outputs. Output users of the vehicle inventory MIS include: Chief of Staff of the Defense Administration, Minister of Finance, Defense Logistics Assistant, Paban, Karo, and others but with the knowledge of the Defense

Logistics Office. Outputs are reproduced and distributed to the respective users as required: it may be a report of fuel requirement, battery requirement, tire requirement, or it may be a summary of the vehicle inventory by vehicle classification, condition, and location (reporting unit). System outputs should accommodate any exception report that may arise. Paban or Karo should ensure that all the outputs produced are optimally used.

Test and Implement the System

As Described by Ross

From the managerial point of view, the last two steps in system design involve testing the soundness of the design process to this point and developing an implementation plan (15:256-259).

Testing the System. Upon the completion of the conceptualization, the design can be tested to see whether it yields the approximate outputs to meet the previously defined objectives and information needs. If not, the system may require redesign efforts at the conceptual level and a review of the process leading up to the test.

One popular method of system test is the parallel test, which involves running past and current data through the new system without eliminating the old system. Having debugged the new system and proved that it is workable, the old system is abandoned. Another type of system test is a

pilot test that uses a part of the new system for test by assuming that the part represents the whole.

Implementing the System. Implementation is the longest and usually the most costly step in system development. Since the system is designed for the manager to use, then he should plan and supervise its implementation. The manager should become involved in the seven aspects of implementation:

1. The data processing plan;

2. The establishment of application priorities;

3. The selection of equipment, if any;

4. The organization of his department to utilize the information system;

5. The establishment of authority/responsibility assignments to develop, implement, and utilize computers and system;

6. The staffing of study and project teams;

7. The provision of a good environment for the information system.

Implementation planning is essential. The extent and detail of the plan depend upon the system to be implemented; nevertheless, the manager should become involved in its development and subsequent control (10:145; 15:259).

Training is a major consideration in implementation. Proper organization of training sessions would orient users

with the new system. Without the user's cooperation, the system is bound to fail.

As It Is Applied to the Indonesian Defense Logistics Office

In the Indonesian Defense Logistics environment, testing the new system would best occur by conducting a pilot test for some of the reporting units in the Jakarta[1] area. The pilot test would cover four key aspects:

1. Testing how the data collection/updating forms are completed.

   - User understanding of the terms used
   - Forms accuracy
   - User understanding of the coding system
   - Time required for the forms to be completed and delivered from the reporting unit to the Defense Logistics Office
   - Endorsement of the completed forms by the Logistics Officer at the reporting unit

2. Testing the validation procedures to check whether all the intended validation checks are met--for instance, the elimination of duplicate records.

3. Testing the computer program in creating the inventory files.

---

[1]Jakarta is the capital city where the Defense Logistics Office is located.

4. Testing the computer outputs for meeting the objectives of the system.

When the results of the pilot test satisfy the objectives, the new system is feasible to be implemented throughout the entire Indonesian Defense Logistics Organization.

Implementing the System. Assisted by the Karo (head of bureau), the Paban (section head) should plan and supervise the system implementation. The managers (Paban and Karo) should become involved in seven critical areas:

1. The data processing plan. The managers should be aware of the specific actions involved in the data processing plan. These activities include data entry with its data verification, validation, creation of table files and inventory master files, output production, and files maintenance. The managers should also be aware that data processing activities require the provision of manpower, hardware, software, and time. Manpower includes computer operators, programmers, and systems analysts. Hardware includes data entry system, computer main frame, and its peripherals. Software includes forms, computer programs, procedures, and manuals. Because the Defense Data Processing Center also handles processing for other systems such as Finance MIS, Personnel MIS and others, the managers should be aware that the processing schedule being developed will also need to consider other systems' processing schedules.

2. The establishment of priorities. There are nine major items presently managed by the Indonesian Defense Logistics Office. Constrained by the availability of personnel and complexities involved, the Logistics Assistant, assisted by the Pabans (section heads), needs to determine the sequence of priorities for which items the MIS will be developed.

3. The selection of equipment. With the current policy of centralized processing and with the computer system available at the major commands and at the Defense Data Processing Center, equipment selection is not needed.

4. The use of the information system. The Logistics Assistant and Pabans (section heads) should direct and encourage Karo (heads of bureaus) in their respective section to make an optimum use of the information system.

5. Each Paban (section head) is responsible for the development and implementation of the MIS related to his section. There should be a close coordination among the Pabans so that the subsystems can be integrated.

6. The staffing of study and project teams. Some applications may require a project team (5:21), with the size of the team depending on the size of the project. Team members are selected from the different sections in the Defense Logistics Office, Major Command Logistics Offices, and the Data Processing Departments. For a large or long term project, a steering committee can be established to direct the

project teams. The steering committee consists of the top management and his staff of the Defense Logistics Office, Major Command Logistics Offices, and the Data Processing Departments. Transient consultants can be made available when specific advice is requested.

7. The provision of a good environment for information system. Each major milestone of the MIS development needs approval from the Defense Logistics Assistant. In addition, close communication between the functional managers and the data processing personnel should be maintained to avoid any misunderstanding.

The Paban (section head) or Karo (head of bureau) assigned to the MIS development should supervise the implementation plan in its entirety: personnel training, computer software, forms design, creation of data files, operation of the new system in a parallel test, cut over from the old to the new system, and evaluate and refine the new system.

Evaluate the System

As Described by Ross

After the MIS has been operating for a short period of time, an evaluation of each step in the design and of the final system performance should be made (15:260). In conducting an evaluation, the following questions need to be answered: "How does the system now perform and how would we

like it to perform?" "Does it achieve the system objectives effectively?"

Measures of effectiveness should be expressed in quantitative terms such as rates, dollars, volume, items, etc. For example, if the objective is to reduce shortages, a measure might be the percentage reduction in shortages as a result of system installation.

<u>As It Is Applied to the Indonesian Defense Logistics Office</u>

Review of the status of the new system should occur after a reasonable period has been allowed for implementation, generally at least a year (17:94). Paban (section head) and Karo (head of bureau) related to the system should evaluate whether the objectives of the system have been met effectively. In particular, the managers (Paban and Karo) should determine whether the benefits are such that the cost of development and operation are justified, whether the system is easy to use or rather cumbersome.

The managers should determine whether the outputs produced satisfy their intent and appear in usable forms. Other factors that also need some concern include the system's realiability, the system's expandability, the system's integration, and the system's flexibility. System reliability refers to the minimum data errors entering the system; system expandability refers to the future growth capability; system integration refers to the extent to which the system

provides for the interrelationship of files, functions, etc.; system flexibility refers to the variety of output that the system will provide.

In the case of the vehicles inventory system, for instance, some measures of effectiveness can be expressed in the reduction of the quantity of fuel, batteries, and tires required.

Establish Documentation System

As Described by Ross

Documentation is frequently overlooked or inadequately performed. The reasons for documentation are self-evident: should the original designer leave the organization or should the system need some modification, the previous documentation will be very valuable for reference purposes.

A complete documentation effort would include most, if not all, of the following items (15:291-282):

1. User Project Request
2. Cost/Benefit Analysis
3. Document of Understanding (delineates responsibilities between the data processing department and the users department)
4. User Design Specifications
5. System Controls
6. Procedures (including flow diagrams, procedure narratives, and disaster recovery actions)

7. Computer Programming

8. Implementation Summary

As It Is Applied to the Indonesian Defense Logistics Office

A well organized documentation will provide management with readily available references if review or modifications are required to the existing system. For any MIS development in the Defense Logistics Office, the following type of documentations are recommended:

1. User Project Request. This document outlines the understanding between the Defense Logistics Office and the Defense Data Processing Center regarding the scope of the system. This document provides the basis upon which further design effort proceeds; it includes statement of the problem, description of the service requested, justification of the design effort, estimates of and constraints on implementation costs.

2. Cost/Benefit Analysis. Since the Defense Logistics Office is not a profit making organization, the cost/benefit analysis would include cost savings, reporting time, and controls. For example, the new system may gain cost savings from the elimination of fuel allocation for vehicles that are beyond economical repair or in the process of being disposed.

3. Document of Understanding. As opposed to the project request, the document clarifies such matters as a

definition of responsibilities between the Defense Logistics Office and the Data Processing Center, schedules, and cost.

4. User Design Specifications. This document contains system concept, system flow charts, forms used, inputs, processing, outputs, system controls, disaster recovery procedures, and implementation summary.

5. Computer Programming. This document is prepared and maintained by the Defense or Major Commands Data Processing Center/Installations.

CHAPTER VI

AN EXAMPLE OF STEP THREE OF THE MIS DESIGN (DETERMINATION OF INFORMATION NEEDS)

Any system is developed to meet the user's need for information. In designing a system it is necessary, therefore, to examine the problems and to perceive the general requirements for information as they exist. Thus, step three of Ross' MIS design process is a crucial step that the managers need to clearly define. This chapter describes an example of how to apply step three of the MIS design process in the Indonesian Defense Logistics Office.

In this context, the determination of information needs relates to the three levels of management/users previously described in Chapter V--namely, the Defense Administration Chief of Staff and the Defense Logistics Assistant as the top level, the section heads as the middle level, and the heads of different bureaus as the lower level. A short-cut approach for determining their information needs is to derive these needs from the output requirements of the managers at these three levels. Analysis of the information needs as they are related to the output requirements of each management level is principally the same even though they differ in details.

Having defined the information needs based on the

output requirements, the data collection process can begin. The example discusses three alternative approaches: (1) collect as much data as possible; (2) collect as little data as possible; and (3) collect the directly related data.

Output Requirements

As indicated in the discussion in Chapter II, the Indonesian Defense Logistics Office has the following output requirements (18):

1. Annual Inventory Summary Report for the Office of the Minister of Finance. This report includes the number of vehicles, their condition, types of fuel used, and the vehicle's present value.

2. Ad hoc Vehicles Inventory Summary Reports for the Office of the Defense Administration Chief of Staff. These reports may contain data such as the number of vehicles, make, model/type, year, condition, and location.

3. Various reports required by the section heads in the Indonesian Defense Logistics Office such as for the planning of vehicle procurement and disposal, goods and personnel transportation, and vehicle standardization.

4. Reports on the annual requirements of fuel, batteries, and tires. Fuel requirements are broken down further into monthly requirements. These outputs are compiled and used by the heads of specific bureaus.

Three Alternative Approaches

To determine the information needs to meet these output requirements, there are three alternatives to consider:

1. Collect as much data as possible. By doing this, the managers expect that they will be capable of producing any report because they have most, if not all, the information or data that might be required. However, this approach has the following disadvantages:

    a. The form used for the data collection becomes complicated. There are too many data elements to cover within the limited space.

    b. Definition of terms becomes a problem, since the terms used must be clearly understood by all the personnel involved.

    c. The relatively large and complicated form, and the long list of definition of terms, can cause confusion to those who fill out the forms. As a result, a high percentage of the columns in the form are blank, as experienced in the 1972 materiel census.

    d. The paperwork is a very time consuming effort. It requires time to prepare the definition of terms, codes, and users' manuals.

e. It is costly; costs are incurred for the paperwork, conferences, file creation, and maintenance.

f. Due to the expectation that most of the data will be collected, the managers tend to give less attention to defining the output requirements and information needs.

2. The second alternative is to collect as little data as possible. Data is categorized as identification, static, and dynamic data. Identification data is used as a key identifier to a particular vehicle, much as the SSN is used as a personnel identification. Vehicle identification data include license number and serial number. Static data consist of those vehicle characteristics which do not change. Characteristics data include vehicle make, type, year, battery voltage and ampere-hour, size of tire, type of fuel, gross weight, and load capacity. However, this second alternative emphasizes that most of the characteristics data, if not all, should not be collected from the reporting or using units. Characteristics data to be collected would be limited to, for instance, vehicle make, type, and year. Eliminating data that is readily available elsewhere can reduce as much as possible the burden of the reporting or using units to complete the forms. It is assumed that the managers could complete the rest of the characteristics data from the vehicle manuals or from past historical records.

The third data category is the dynamic data which include data that may change from time to time such as vehicle condition and location. To summarize, this second alternative emphasizes the need to collect dynamic data while compiling characteristics data from manuals and past historical records.

3. The third alternative is an approach between the first and the second alternatives. This alternative realizes the fact that the availability of the required auto manuals or past historical records either at the Defense Logistics Office or at the services' headquarters is very limited and becomes even more difficult for older vehicles. As a particular problem, the Indonesian Defense inventory contains a very wide range of make and type; also, combat/military design vehicles are not included in regular reference manuals. Apart from collecting the identification and dynamic data as described in the second alternative, this third alternative stresses the need to collect information which is directly related to the output requirements.

The following is an example of output requirements and information needs relationship that reflects the approach used by the third alternative.

Example 1

1. Output requirements: annual fuel estimate. The Defense Logistics Office prepares fuel

estimates annually, prior to the beginning of each fiscal year. The annual estimate is then broken down to monthly periods.

2. Information needs to support this output requirement include:

a. The current quantity of vehicles that use gasoline

b. The current quantity of vehicles that use kerosene/diesel

c. An estimate of the procurement quantity for the coming fiscal year

d. A fuel consumption index for individual classification of vehicles that are currently used by the Indonesian Defense Logistics Office. (Note: The Indonesian Defense Logistics Office has classified general and special purpose vehicles, combat vehicles not included, into (7:5-6): motorcycles, sedan, station wagon, small-medium-large bus, and light-medium-heavy truck. Fuel consumption varies with age depending on the condition of the vehicle. With this assumption in mind, the Indonesian Defense Logistics Office has been using fuel consumption index instead--for example, 2 gallons of gasoline per day for a sedan or light truck, 4 gallons

of gasoline per day for a medium size bus, 8 gallons of kerosene per day for a heavy truck, etc.)

To get a summary of the quantity of the vehicles with two types of fuel, the system needs to collect the type of fuel of the individual vehicle. Type of fuel would be easy enough for the people in the field to record.

A question may arise whether all vehicles, no matter what their condition, would receive fuel allocations as the current procedures permit (18). There are three categories of condition that the Indonesian Defense Logistics Office uses, namely: good, needs minor repair, and needs major repair. For their annual projection, the managers might need to consider whether those vehicles that need major repairs should not receive fuel anymore, or at least no fuel allocation until they are repaired. Many of them are about due to be processed for disposal. Therefore, data on their condition may need to be collected.

Example 2

1. Output requirements: battery and tire requirements.

2. Information needs to support these output requirements include:

a. Battery technical specification of each individual vehicle, e.g., 12 volt, 60 ampere-hour; 24 volt, 100 ampere-hour, etc.

b. The tire size/specification of each individual vehicle. Tire size is always written on the outside tube of the vehicle wheel, and this can be easily read and recorded.

c. If the condition also affects whether the vehicles may receive batteries/tires or not, then condition needs to be collected also.

Example 3

1. Output requirement: vehicle inventory summary for procurement and disposal planning.

2. Information needs to support this requirement include:

a. Current procurement regulations and policies

1) How does the regulation relate to the TOE (Table of Equipments) of the using units? How does the regulation relate to the quantity of vehicles that are owned by the units and the number that are still required?

2) What is the policy on vehicle standardization? Is there any plan to narrow down the wide range of make and type of those vehicles in the present inventory? This may require a report summary by vehicle year, make, and type.

b. Current regulations and policies on vehicle disposal. At what age or condition does a vehicle need to be considered for disposal; i.e., information on the vehicle year and condition is required?

Table 1 summarizes the three alternatives as applied to examples 1, 2, and 3. From the three alternatives, alternative three seems to be the most favorable approach.

TABLE 1

COMPARISON OF THE THREE ALTERNATIVES
AS APPLIED TO EXAMPLES 1, 2, AND 3

	Alternative 1	Alternative 2	Alternative 3
Data Collection	Identification data	Identification data	Identification data
	- License number	- License number	- License number
	- Serial number	- Serial number	- Serial number
	- Code of the reporting or using unit	- Code of the reporting or using unit	- Code of the reporting or using unit
	Dynamic data	Dynamic data	Dynamic data
	- Condition	- Condition	- Condition
	- Location	- Location	- Location
	Static (characteristics) data	Static (characteristics) data	Static (characteristics) data
	- As much as possible	- As few as possible	- Collect those that are directly related to the output requirements

TABLE 1 - Continued

Alternative 1	Alternative 2	Alternative 3
- Classification (sedan, bus, etc.)	- Classification (sedan, bus, etc.)	- Classification (sedan, bus, etc.)
- Make and type	- Make and type	- Make and type
- Vehicle year	- Vehicle year	- Vehicle year
- Type of fuel		- Type of fuel
- Size of tire		- Size of tire
- Battery specification		- Battery specification
- Load capacity		
- Gross weight		
- Overall length, width, and height		
- Wheelbase		
- Gas tank capacity		
- Type of lubricant		

TABLE 1 - Continued

	Alternative 1	Alternative 2	Alternative 3
Volume of paperwork	High	Medium	Low
Project completion time	Long	Reasonably long	Reasonably short
Cost	High	Lower than alternative 1	Lowest

CHAPTER VII

CONCLUSIONS AND RECOMMENDATIONS

This final chapter presents the conclusions and recommendations of this research effort. It reemphasizes that there is a cause and effect relationship between the manager's participation and the failure of the MIS to be developed. Finally, this chapter recommends further research and study for the improvement of the existing MIS procedures in the Indonesian Defense Logistics Office.

Conclusions

Different authors have studied the success and failures of MIS, and of all the reasons for MIS failures, lack of managerial participation heads the list. The objective of this research was to develop a procedure to describe the basic roles of the managers in the Office of the Indonesian Defense Logistics Assistant during the MIS development. Such a procedure was selected so that it would be available as a guide or reference for the managers to place their roles in the development of a successful MIS.

Chapter VI of this research gave some examples of information needs determination; the analysis of the alternatives presented showed that the aspects to be considered should be well understood by the managers in the Indonesian

Defense Logistics Office. The logistics staff managers were the ones who knew well the regulation and policies, either formally written or not, and they were also the ones who had the final judgement. The depth of managerial involvement in each step of the MIS development might not be the same, but managerial control and awareness of what is going on in the systems development should always be present.

The time is rapidly approaching when the logistics MIS will become a vital part of the operation of the Indonesian Defense Logistics Office, and the success of that MIS will depend on the effective involvement of the logistics managers.

Recommendations for Further Research and Study

This research showed the importance of continuous, active involvement of the managers in the Defense Logistics Office for a successful logistics MIS. The managers' roles during the MIS development were outlined in Chapter V. However, when it comes to the actual MIS implementation, the outline needs to be developed further as to how the managers' roles should take effect. Further research is therefore recommended. This further research can be approached by:

1. The application of the MIS procedures, as outlined in this research, to a more detailed analysis--for instance, the example of determining information needs as discussed in Chapter VI.

2. The application of the MIS procedures, as outlined in this research, to other inventory items in the Indonesian Defense Logistics Office.

3. The application of additional system documentation as outlined in the last portion of Chapter V.

For this additional research, the following suggestions are offered:

1. A seminar-type staff meeting between the Defense Logistics Office and the Defense Data Processing Center should be conducted. The seminar should provide the participants with current inventory problems and issues in the defense logistics area, followed by some general ideas on how the MIS procedures, as outlined in this research, can be applied.

2. A task force should be assigned to further analyze the key issues using the outlined MIS procedures as a stepping stone. The task force should meet on a regular basis within a given time frame.

3. Other current MIS literature could be used that may expand and improve the MIS procedures as already outlined in this research.

SELECTED BIBLIOGRAPHY

REFERENCES CITED

1. Burch, John G., Jr., Felix R. Strater, and Gary Grudnitski. Information Systems: Theory and Practice. Toronto: John Wiley & Sons, Inc., 1979.

2. Davis, Gordon B. Management Information Systems: Conceptual Foundations, Structure and Development. New York: McGraw-Hill Book Company, 1974.

3. Dearden, John. "MIS Is a Mirage," Harvard Business Review, Vol. 50, No. 1 (1972), pp. 90, 93.

4. Hartman, W., H. Matthes, and A. Proeme. Management Information Systems Handbook. New York: McGraw-Hill Book Company, 1968.

5. Harvath, Charles, and Bruce W. Chilcoat. Bridging the Systems Expectations Gap. AMACOM, a division of American Management Association, New York, 1973.

6. Holmes, Robert W. "Twelve Areas to Investigate for Better MIS," Financial Executive, July 1970, p. 25.

7. Indonesian Department of Defense. DOD Directives on Data Reporting of Weapons and Ammunitions, General and Special Purpose Vehicles, Properties and Installations. Jakarta, Indonesia, 1981.

8. ________. DOD Directives on Defense Management Information Systems. Jakarta, Indonesia, 1973.

9. Indonesian Department of Finance. Department of Finance Directives on Government Property Reporting. Jakarta, Indonesia, 1971.

10. Kanter, Jerome. Management-Oriented Management Information Systems. Englewood Cliffs NJ: Prentice-Hall, Inc., 1977.

11. Krauss, Leonard I. Computer Based Management Information Systems. n.p.: American Management Association, Inc., 1970.

12. Ligon, Helen H. Successful Management Information Systems. n.p.: Umi Research Press, 1978.

13. Murdick, Robert G., and Joel E. Ross. Information Systems for Modern Management. Englewood Cliffs NJ: Prentice-Hall, Inc., 1971.

14. Nichols, Gerald E. "On the Nature of Management Information," Management Accounting, April 1975, pp. 10-11.

15. Ross, Joel E. Modern Management and Information Systems. Reston VA: Reston Publishing Company, Inc., 1976.

16. Schoderbek, C. G., P. P. Schoderbek, and A. G. Kefalas. Management Systems--Conceptual Considerations. Rev. ed. Dallas TX: Business Publications, Inc., 1980.

17. Voich, Dan, Jr., Homer J. Mottice, and William A. Schrode. Information Systems for Operations and Management. Cincinnati OH: South-Western Publishing Co., 1975.

18. Wreksomindojo, Major Sudaryanto E., Indonesian Army. Systems Analyst, Indonesian Defense Data Processing Center. Note taking. January 1977 to May 1982.

END

FILMED

12-83

DTIC